was a rapid rise of temperature followed by marked improvement in the condition of the animal. This observer believes that antitoxine can be obtained by this method that will be much more suitable for the treatment of the human subject than those obtained by the ordinary methods. His experiments, however, are far too few to carry any great weight, though they open up a most interesting field for future investigation.

(*To be continued.*)

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The extension of the buildings of the Cavendish Laboratory is about to be undertaken, at an expense of over £4000. About half the cost will be met from the accumulated fees of students working in the laboratory.

Mr. E. Hamilton Acton, Fellow and Lecturer in Chemistry of St. John's College, died suddenly, from heart disease, on Friday night. Mr. Acton was only in his thirty-third year; but he had earned a considerable reputation as a chemist, and his researches in vegetable chemistry, in particular, were of importance. He was an able and successful teacher. His funeral on Tuesday was attended by some hundreds of the junior members of the University, and by representatives of all the scientific departments.

MR. ROBERT PERKINS, of Jesus College, Oxford, leaves England next week for Honolulu to resume his investigations on behalf of the Joint Committee appointed by the Royal Society and the British Association for the zoological exploration of the Sandwich Islands. The large collections he made there during his former stay (March 1892 to September 1894) have been submitted to various specialists, with results that show him to be an indefatigable observer in all branches of terrestrial zoology; and, since his return to England last autumn, he has been busily engaged in discovering what has yet to be done to complete our knowledge of the indigenous Fauna which is so rapidly disappearing.

THE County Councils of Northumberland and Durham are truly advancing technical education by affording assistance to Dr. W. Somerville, Professor of Agriculture in the Durham College of Science, to carry out extensive manurial trials. The experiments were begun in 1892, on nine farms in Northumberland; in 1893, when Durham joined in the work, the number of farms rose to twenty-six; while during 1894, the trials were made at no less than forty-three different centres in the two counties. The investigations must have a not inconsiderable influence upon the prosperity of the agriculture of the district to which they refer.

THE Technical Instruction Committee of the Essex County Council, with a view to promoting the spread of scientific knowledge among those engaged on the coast in the fishing industries, started a modest biological station at Brightlingsea last year, and, under the superintendence of Mr. J. T. Cunningham, a number of specimens were collected for the purposes of demonstration. Some experiments on the continental method of growing oysters were also commenced but, owing to the unfavourable character of the season, the results could not be carried very far. We are glad to learn, however, that the Committee, in conjunction with the Borough Council of Colchester, propose to carry on the work of the station, and that the Fishmongers' Company have also shown their appreciation of the movement by giving a grant of £50 per annum for three years.

THE Manchester Town Council have accepted a tender for the erection of a technical school at a cost of £140,000.

SCIENTIFIC SERIALS.

American Journal of Mathematics, vol. xvii. No. i. (January, 1895).—Sur une transformation de mouvements, P. Appell, is a treatment of Elliot's problem (*Comptes rendus*, 1893), and of a question solved by Mestschersky, in the *Bulletin des Sciences Math.* 1894, as a particular case of transformation of movements.—An extract from a letter addressed to Dr. Craig by M. Hermite, gives the result of an investigation of the asymptotic value of log $\Gamma(a)$ when a is large.—On the first and second logarithmic derivatives of hyperelliptic functions, by Oskar Bolza, opens with a statement of certain well-known theorems of the theory of elliptic functions, and then extends these and some allied theorems to hyperelliptic functions.—Sur la definition de la limite d'une fonction. Exercice de logique mathématique, by Prof. Peano. The definition is one previously used by the writer, and also by two or three previous writers. It is practically given by Abel (*Works* ii. p. 199), in the form, "Pour qu'une série Σu_n soit convergente, il faut que *la plus petite des limites* de nu_n soit zéro." The same general idea of a limit is given in Cauchy's "Cours d'Analyse algébrique" (1821, p. 13), "quelquefois . . . une expression converge à-la-fois vers plusieurs limites différentes les unes des autres." Prof. Peano works on this definition, and demonstrates at some length its principal properties. To this end he employs la logique mathématique, "Cette science s'est rapidement développée de nos jours, et on l'a appliquée dans plusieurs travaux."—Dr. E. McClintock contributes an article on theorems in the calculus of enlargement (a paper read before the American Mathematical Society, August 14, 1894). It is an interesting sequel to his essay on the calculus of enlargement (vol. ii. pp. 101–161).—In his note on Foucault's pendulum, Mr. Chessin considers the motion of a physical pendulum on the surface of the earth, taking into account the rotation of the earth about its axis. The initial velocity relatively to the earth of the pendulum is supposed equal to zero, as in Foucault's experiment. Hence he retains the name of "Foucault's pendulum," although oscillations of any finite amplitude are considered. The portrait which is given with this number is that of M. E. Picard.

Wiedemann's Annalen der Physik und Chemie, No. 2.—Fluorescence of solutions, by O. Knoblauch. There is a constant ratio between the intensity of the fluorescence and the existing light, even when the intensity of the latter is altered in the ratio of 1 to 6400. The author proves experimentally and theoretically that the effect upon the various fluorescent bodies of varying the solvent is very different.—The potential gradient in the positive portion of the glow discharge, by A. Herz. The potential gradient in the positive unstratified glow discharge of a vacuum tube decreases as the current increases, and also as the diameter of the tube is increased; but it increases with the pressure, though not as rapidly.—Unipolar induction, by Ernst Lecher. The author discusses the different aspects of the question whether, when a cylindrical magnet rotates about its axis, the lines of force due to it are stationary, or rotate with the magnet. The former was Faraday's original view, the latter has been maintained by Tolver Preston and others. After showing that all the experiments hitherto quoted as decisive one way or the other may be equally well interpreted on either assumption, he describes some test experiments which show that the lines of force stand still while the magnet rotates.—Electric dispersion, by P. Drude. A method is described for investigating the relation between the dielectric constant of a substance and the period of the electric waves traversing it, or what may be described as the electric dispersion of the substance. If the dielectric constant decreases as the period increases, there will be normal, if it increases, anomalous dispersion. For alcohol the dispersion was found to be normal, and of the same order of magnitude as its optical dispersion. Water showed abnormal dispersion with the large wave-lengths used, whereas ebonite showed no perceptible dispersion.—Effect of kathode rays upon some salts, by E. Goldstein. Lithium chloride, when exposed to Kathode rays, assumes a heliotrope or dark violet colour, which it retains for some time in a sealed tube. Chlorides and other haloid salts of potassium and sodium show similar effects. The colours are very superficial, and disappear on heating, or by the action of moisture.

SOCIETIES AND ACADEMIES.

LONDON

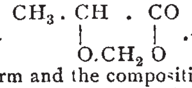
Geological Society, January 23.—Dr. Henry Woodward, F.R.S., President, in the chair.—Carrock Fell: a study in the variation of igneous rock-masses. Part ii. The Carrock Fell Granophyre. Part iii. The Grainsgill Greisen, by Alfred Harker. The augite-granophyre of Carrock Fell was first described in its normal development, special attention being drawn to the various types of micrographic intergrowths which it exhibits. The variation of the rock was next examined, and, in particular, a curious basic modification which occurs near its junction with the gabbro described in a former paper. The granophyre here passes into a coarse type rich in augite, iron ores, and apatite, its silica-percentage falling to as low as 58. The author attributed this to the acid magma having incorporated in itself portions of the highly basic margin of the gabbro. The latter rock seems to have been fused or dissolved by the magma, with the exception of certain of its more refractory minerals which survive in the modified marginal part of the granophyre. The latter part of the paper dealt with a remarkable quartz-mica rock found on the north side of the Skiddaw granite. It differs in some respects from the Cornish greisens, and resembles in its mode of occurrence certain pegmatites in the Scottish Highlands. The author considered the rock to have been extruded from the granite in connection with the post-Silurian crust-movements of the district, while its composition has probably been further modified by subsequent chemical changes.—The geology of the country around Fishguard (Pembrokeshire), by F. R. Cowper Reed.—The tract of country forming the subject of this communication occupies the northern part of Pembrokeshire, from Newport to Strumble Head.—On the mean radial variation of the globe, by J. Logan Lobley. The author submitted considerations (chiefly derived from the characters of the earlier sediments) which led him to suppose that crust-folds have not been produced by continuous contraction of the earth, and that the planetary heat and mean radius of the earth have been practically invariable during the period which has elapsed since Cambrian times.

Zoological Society, February 5.—Sir W. H. Flower, K.C.B., F.R.S., President, in the chair.—A communication was read from Dr. E. A. Goeldi, in which he described the breeding-habits of some tree-frogs observed by him in the Province Rio Janeiro. *Hyla faber*, Wied, constructs nests of mud on the shallow borders of ponds, wherein the young are protected from enemies whilst in the larval state. *Hyla goeldii*, Boulenger, dispenses with the metamorphoses, which are hurried through within the eggs, these being carried by the female on her back. *Hyla nebulosa*, Spix, deposits its eggs in a slimy mass attached to withered banana-leaves, the young remaining in this sort of nest until in the perfect, air-breathing condition.—Mr. Edgar A. Smith gave an account of a collection of land-shells made principally by Mr. A. Everett at Sarawak, British North Borneo, Palawan, and other neighbouring islands.—Mr. Oldfield Thomas read a paper upon the long-lost mammal *Putorius africanus*, Desm., and its occurrence in Malta.—Mr. F. E. Beddard, F.R.S., read a paper on the visceral anatomy of the tree-kangaroo (*Dendrolagus bennettii*), and pointed out the structure of the brain and other organs.

CAMBRIDGE.

Philosophical Society, January 28.—Prof. J. J. Thomson, President, in the chair.—The following resolutions were proposed by Prof. Sir G. G. Stokes, seconded by Mr. Glazebrook, and passed unanimously: (1) "That the Cambridge Philosophical Society desires to express its sense of the great loss sustained by the University and the Society by the death of Prof. Cayley; whose eminence conferred honour on the Society which reckoned him amongst its Presidents, and whose simple and earnest character was an example to all and endeared him to those who knew him." (2) "That the Society do now adjourn without transacting the business of the meeting, as a mark of respect to Prof. Cayley."

PARIS.

Academy of Sciences, February 11.—M. Marey in the chair.—M. Faye gave a short account of the contents of volumes iv. and v. of the *Annales de l'Observatoire de Nice.*—On the presence and distribution of alumina in plants, by MM. Berthelot and G. André. Alumina is found in quantities comparable with the amounts of other bases present, mostly in the roots of plants having deep and abundant roots.—Preparation and properties of titanium, by M. Henri Moissan. Titanium has been prepared in the electric furnace. It requires the most intense heat capable of production, and even then contains at least 2 per cent. of carbon. It forms friable masses, having a bright white fracture. It is harder than quartz and steel. Its specific gravity is 4·87. The chemical properties are given in detail. Its silicide and boride are as hard as the diamond. The carbide, TiC, and nitride, Ti_2N_2, are also fully described.—On some derivatives of phenolphthaleïn, by MM. A. Haller and A. Guyot.—M. Guignard was elected Member of the Botany Section.—Report on a work by M. E. Hardy relative to the application of sound vibrations to the analysis of two gases of different densities. By means of an instrument (termed a Formènophone) consisting essentially of two pipes tuned to give the same note, and blown with air and with air containing a lighter gas, the quantity of lighter gas present may be ascertained by the production of beats between the sounds emitted by the two tubes.—On a property of meromorphic functions, by M. Émile Borel.—On certain systems of equations to the derived partials, by M. J. Beudon.—On the electrostatic capacity of resistance bobbins, and its influence in the measurement of coefficients of induction by the Wheatstone bridge, by M. J. Cauro. Bobbins with double coils should only be used for small resistances; if the resistance increases, a capacity-error greater than that due to self-induction may be caused. To minimise capacity-errors the Chaperon winding should be used. These capacity effects may be neglected in measurements made with ordinary Wheatstone bridges; but they come into play with bobbins having small coefficients of self-induction with great resistances.—On the measuremement of luminous flux, by M. A. Blondel.—On the passage of light across a thin plate in the case of total reflection, by M. Ch. Fabry. The formulæ of thin plates are shown to apply without modification to the case of a transparent spot at and surrounding the point of contact of a convex and plane-glass surfaces when the included thin plate is viewed at the angle of total reflection.—On the lowering of the freezing-point of dilute solutions of sodium chloride, by M. A. Ponsot. The author obtains results by his own method differing from those of previous observers. He finds that in the limit the lowering of the freezing-point is proportional to the number of grams of salt existing in 100 grams of solution.—On sulphide of gold, by M. A. Ditte. The behaviour of gold sulphide in presence of alkaline sulphides, with and without excess of dissolved sulphur, is described. The compounds: $Au_2S.2Na_2S.20H_2O$ and $Au_2S.Na_2S.10H_2O$ and $Au_2S.4K_2S_2.12H_2O$ are noted.—On a method of causing the crystallisation of precipitates; manganese and zinc sulphides and cupric hydrate, by M. A. Villiers.—On cinchonigine, a case of dimorphism of a compound having a specific molecular rotatory power, by MM. E. Jungfleisch and E. Léger. Cinchonigine is dimorphous, its two forms readily passing from one to the other. The monoclinic form is stable at the ordinary temperature, the rhombic form at about 35°.—On the plurality of chlorophylls; the second chlorophyll isolated from lucerne, by M. A. Étard.—A comparison between the coloured and colourless derivatives of hexamethyl triamidotriphenylmethane, by M. A. Rosenstiehl.—On a new type of ethereal salt, methylene lactate, by M. Louis Henry. The preparation and properties are described of the substance represented by the formula  $\begin{array}{llll} CH_3\,. & CH & . & CO \\ & | & & | \\ & O.CH_2 & & O \end{array}$.—On the relation between the general form and the composition of the body in protozoa, by M. Félix Le Dantec.—A study of the agricultural value of the phosphate of aluminium from Grand-Connétable, by M. A. Andouard.—On the contact phenomena of the lherzolite of the Pyrenees, by M. A. Lacroix.—New relations between the barometric movements in the northern hemisphere and the movements of the sun and moon in declination, by M. P. Garrigou-Lagrange. (1) In the northern hemisphere the atmosphere oscillates about the 30 h parallel, corresponding to the movement of the moon in declination, so that the pressures are lower with boreal than with austral moon below 30°, and inversely above. (2) The gradients take corresponding modifications. The barometric slopes from 30° south and north, are alternately increased and lowered, more strongly with boreal moon below 30°, more feebly above, and inversely with austral moon. (3) These differences in pressures and gradients augment towards the pole, at least up to the 70th parallel. (4) These movements are superposed on more general movements.

AMSTERDAM.

Royal Academy of Sciences, December 29, 1894.—Prof. Van de Sande Bakhuyzen in the chair.—A treatise on a simple method of roughly distinguishing between Scandinavian and southern diluvial sand, and between alluvial and diluvial sand, by separating the heavy minerals from the sand through immersion of the sand in a fluid of a specific gravity of 2·88, invented and described by Dr. J. L. C. Schroeder van der Kolk, formed the subject of a report drawn up by Mr. Van Diesen and Dr. Behrens—Mr. Schols and Mr. Martin reported upon an essay by Mr. J. J. A. Muller, in which the author calculated the dislocation undergone by some parts of the mountain system of Sumatra, in consequence of the earthquake of May 17, 1892. These calculations, which are based on data supplied by the measurements executed in the said island, on behalf of the secondary triangulation, prove with great certainty a horizontal shifting of the following three points to the extent, and in the direction indicated :—

Sorik Merapi	1·23 M.	344° 57′
Tor Si Hite	0 64 M.	149° 2′
Goenveng Malintang ...	1·24 M.	304° 28′

the directions being counted from the north point, going round through the east.—Dr. Jan de Vries discussed some methods of deducing from given configurations more complicated configurations. In particular a series of configurations, first described by Andreef, was deduced from the tetrahedron by means of a system of polar coordinates.—Dr. Bakhuis Roozeboom, in considering the experiments of Prof. Spring, on the conversion of black into red HgS, showed that this author was mistaken in the nature of the phenomenon, which belongs to the category of the conversion of unstable modifications into stable ones. The pressure required for a conversion of this description does not admit of being expressed by a simple law.—Dr. P. van Romburgh has examined, in the laboratory of the "culture" garden at Tjikeumeuh, a number of coca-leaves grown in Java, in order to ascertain their volatile constituents. Those of *Erythroxylon Coca Lam.* var., *Spruceanum* (Burck), when distilled with water, produced methyl-salicylate (about 20 c.c. was obtained from 140 kgrs. of fresh leaves). In the water was also found a little acetone and methylic alcohol, and perhaps also traces of salicylic aldehyde. The quantity of methyl salicylate decreases in proportion as the leaves grow older ; in fresh unexpanded top leaves Dr. van Romburgh found 0·13 per cent., in young leaves from 0·06 to 0·07 per cent., in old leaves even less than 0·02 per cent. The leaves of *Erythroxylon Bolivianum* (Burck) were also proved to contain methyl salicylate, but only 0·004 per cent., as well as those of *E. ecarinatum* (Burck), but not those of *E. Burmanium* (Grift) and *E. longepetulatum* (Burck), while in the case of *E. spec. insul. Comor* the results were doubtful.—Prof. Kamerlingh Onnes read a paper on the Kryogene Laboratory at Leyden, and on the production of extremely low temperatures. The object of the author in starting his investigations, upwards of ten years ago, viz. the combination of Wroblewski's and Olszewski's labours with those of Pictet, has been quite satisfactorily attained with the least possible means. Liquid oxygen is stored in a glass vessel adapted for experimenting and observing purposes; the oxygen vapours are continuously compressed, liquefied, and again poured into the said vessel, so that the evaporation from the surface takes place at a level pretty nearly constant. With the aid of a small quantity of circulating oxygen, a bath of liquefied gas of quarter to a half litre can be maintained under normal or reduced pressure, *ad libitum*. With this method no use is made of Dewar's vacuum vessels. The vessel is protected from convective transference of heat by the oxygen vapour, which cools a special chamber with plate-glass windows. These windows remain quite free from hoar-frost, and do not interfere with the formation of images. The condensation of oxygen is obtained in a spiral tube immersed in liquid ethylene boiling in a copper flask connected with a conjugate vacuum pump and compressor. The circulating ethylene is liquefied in a condenser cooled down to − 80° by a circulation of methyl chloride, or in some cases by carbonic acid. The apparatus is so arranged, and the flask especially is so devised, that only a minimum of condensed gases is required. Only *one and a half* kilogrammes of ethylene is used in the author's ethylene circulation to obtain the abovementioned permanent liquid oxygen bath, in contradistinction to the great quantities mentioned in the accounts of Dewar's experiments —The purifying of gases by means of fractionating at low temperatures was also treated, and a modified form of Cailletet's mercury plunger compressor, used specially for this purpose, was described. The author concluded with a few observations on certain investigations and apparatus in course of execution, and intended to be preparatory to the manipulation of liquid hydrogen in the Kryogene Laboratory of the future.

GÖTTINGEN.

Royal Academy of Sciences.—In the *Nachrichten*, part 4 (1894), the following papers of mathematical and physical interest appear :—Fv. Schilling, the fundamental polygon of Schwarz's *s*-function for the case of complex exponents ; O. Bolza, a *pu* function for the general hyperelliptic case ; R. Dedekind, on ideals (in the theory of numbers) ; E. Riecke, the equilibrium between a deformed homogeneous solid and liquid in contact with it ; E. Riecke, Clausius' condition equation ; A. Hurwitz, on the theory of ideals ; R. Haussner, the numerical coefficients of Weierstrass's σ-series ; G. Pick, invariant processes for higher binary forms ; A. Schönflies, the hexagonoid of Eberhard ; P. Bachmetjew, results as to electrical earth-currents in Bulgaria ; E. Ritter, extension of the Riemann Roch theorem to sets of forms ; A. Sommerfeld, mathematical theory of the inflexion of light and electricity ; W. Voigt, on piezoelectricity in crystals without a centre of symmetry.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—Cod-Liver Oil and Chemistry : Dr. F. A. Möller (Peter Möller). —Mechanics, an Elementary Text-Book, Theoretical and Practical. Dynamics : R. T. Glazebrook (Cambridge University Press) —Colour Vision : Captain W. de W. Abney (Low).—The Student's English Dictionary : Dr. J. Ogilvie, new edition (Blackie).—The Story of the Stars : G. F. Chambers (Newnes).—Universal Electrical Directory, 1895 (Alabaster).—On the Geographical Distribution of Tropical Diseases in Africa : Dr. R. W. Felkin (Edinburgh, Clay).—Philosophy of Mind : Prof. G. T. Ladd (Longmans).

PAMPHLETS —Le Service Chronométrique a l'Observatoire de Genève, &c. : Prof. R. Gautier (Genève, Aubert Schuchardt). Origen Poliédrico de las Especies : A. Soria y Mata (Madrid, Establicimiento Tipográfico).

SERIALS.—Engineering Magazine, February (Tucker).—Journal of the Franklin Institute, February (Philadelphia).—Himmel und Erde, February (Berlin, Paetel).—Internationales Archiv für Ethnographie. Band viii. Heft 1 (K. Paul).—Journal of the Anthropological Institute, February (K. Paul).—Journal of the Asiatic Society of Bengal, Vol. lxiii. Part 2, No. 3 (Calcutta).—Astrophysical Journal, February (Wesley).—Journal of the Chemical Society, February (Gurney).

CONTENTS.

PAGE
Sir Andrew Crombie Ramsay 385

Our Book Shelf:—

Hill : "Harvard College by an Oxonian."—L. . . 386
Dumesnil : "Tableau Métrique de Logarithmes" . 386
Rodway : "In the Guiana Forest. Studies of Nature in Relation to the Struggle for Life." (*Illustrated*) 387
Wüllner : "Lehrbuch der Experimentalphysik."—*pv* 387
Middendorf : "Peru. Beobachtungen und Studien über das Land und seine Bewohner während eines 25-jährigen Aufenthalts" 388

Letters to the Editor :—

The Liquefaction of Gases.—**M. M. Pattison Muir** 388
Argon. (*Illustrated.*)—**Dr. J. H. Gladstone, F.R.S.** 389
The Aurora of November 23, 1894.—**W. H. Wood ; Prof. A. S. Herschel, F.R.S.** 390
The American Association.—**Dr. Wm. H. Hale** . 390
Earthquake in Norway.—**Dr. Hans Reusch** . . . 390
"The Black-veined White Butterfly."—**H. Goss** . 391
The Zodiacal Light.—**Rear-Admiral J. P. Maclear** 391
Oysters and Typhoid 391
Notes 392

Our Astronomical Column :—

Mars in 1894 395
Novel Methods in Photometry 395
Atmospheric Dispersion 396
The Sun's Place in Nature. I. (*Illustrated.*) **By J. Norman Lockyer, C.B., F.R.S.** 396
Nathanael Pringsheim. By Dr. D. H. Scott, F.R.S. 399
The Antitoxic Serum Treatment of Diphtheria. By Dr. G. Sims Woodhead 402
University and Educational Intelligence 406
Scientific Serials 406
Societies and Academies 406
Books, Pamphlets, and Serials Received 408